

OUTBREAK OF FOODBORNE ILLNESS ATTRIBUTED TO TIN

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AN OUTBREAK of gastrointestinal distress among a party of women who attended a bowling league banquet led to identification of a fruit punch as the probable cause. Investigators found a high concentration of tin in the punch which they concluded had resulted from improper storage of the relatively acid beverage in a 5-gallon milk can which had been recently relined. Although tests for copper, zinc, and cadmium were negative, the possibility that other toxic chemicals were present in the retinned can was not eliminated.

On the evening of April 18, 1961, the Denver Department of Health and Hospitals referred to the Tri-County District Health Department in Aurora, Colo., a report from the local Air Force Base infirmary of several cases of "food infection" or "food intoxication." Contact with the infirmary confirmed the report. The patients, who had attended a noon banquet that day at a local restaurant, had been treated for nausea, vomiting, and diarrhea.

The Investigation

A sanitarian from the health department was immediately dispatched to the restaurant to make a preliminary investigation. He ascertained the complete menu served at the banquet and obtained samples of all leftover foods. He also determined the type of food service, the number of people served, names and addresses of persons attending the banquet, sources of food and food products served, and names and addresses of all foodhandlers and other employees involved.

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The investigation revealed that 38 members and guests of a nearby Air Force Officers' Wives Bowling League had attended the banquet. The food was served buffet style. In most instances, the food was satisfactorily protected from contamination, with adequate facilities for icing the cold foods and a steamtable to keep the hot foods hot.

The following morning, members of the bowling league were interviewed, and a complete list of all persons attending the banquet was obtained. A questionnaire, drafted to facilitate tabulating the statistical data needed, was distributed to every person attending the banquet.

Thirty-eight women attended the banquet, and 37 filled out the questionnaire. Thirty-one of the 37 (83.8 percent) reported illness, and 6 (16.2 percent) reported that they were not ill. One questionnaire was not tabulated because of unusual circumstances.

Onset of illness was described as rather abrupt. Typically, the first symptom was a bloating feeling followed by an almost overwhelming nausea, stomach cramps, and vomiting. In the evening, approximately one-third of the patients had a mild diarrhea. The high percentage of patients with nausea, abdominal cramps, and vomiting (table 1), along with a short incubation period, strongly indicated that the illness was caused by a chemical irritant or poison, rather than a bacterial infection or intoxication.

Figuring the incubation period from the time the patient reported eating until she first noticed symptoms, the shortest period was "less than 1 hour" and the longest was 2 hours. Twenty women reported that they first noticed symptoms during eating or immediately after eating, and four said it might have been 2 hours from the time they started eating until they noticed symptoms. A few indicated slight distress even

Table 1. Frequency of symptoms among 30 persons who reported illness following the banquet

Symptoms	Number with symptoms	Percent with symptoms
Nausea.....	29	96.7
Abdominal cramps...	26	86.7
Vomiting.....	21	70.0
Headache.....	17	56.7
Chills.....	11	36.7
Diarrhea.....	10	33.3
Blurred vision.....	5	16.7
Fever.....	4	13.3
Fainting.....	3	10.0
Sore throat.....	3	10.0
Pain.....	2	6.7
Rash.....	1	3.3

before eating, and after eating a small amount, they had to be excused from the table because of extreme nausea. Because of this unusual condition, it was impossible to figure the mean interval between ingestion and distress.

The illness lasted an average of 13.7 hours. The shortest period of illness was 2 hours; the longest, 48 hours. Seventeen of the 30 women reported that they had recovered within 12 hours, but the remainder reported ill effects for a longer time. Six of the women reported seeing a physician.

Attack rates for the foods served at the banquet

indicated that the vodka punch, served before the dinner, and the potato salad were the items most likely to be responsible for the illness (table 2). One woman who did not drink punch reported illness. She was interviewed carefully, and it was learned that she was the only one who developed a rash, and that she was one of three women who reported sore throat and fainting or dizziness. As these symptoms were not characteristic of this outbreak, it is highly probable that her illness was not associated with the banquet food.

Laboratory Findings

Samples of beef, chicken, scallops, gravy, tartar sauce, potato salad, macaroni salad, kidney bean salad, vodka, and fruit punch were submitted to the Colorado State Department of Public Health for laboratory analysis. Attack rates on specific food items and other statistical information which suggested that the outbreak might be due to a chemical poisoning or irritant were reported to the laboratory.

Laboratory analysis of the foods failed to establish evidence of any bacterial contamination which would be pathogenic. Chemical analysis, however, revealed that the fruit punch used as a base for the vodka punch was contaminated with 2,000 mg. of tin per liter of punch. The

Table 2. Attack rates for specific foods served at the banquet

Food	Did eat			Did not eat			Difference
	Total number	Number ill	Attack rate	Total number	Number ill	Attack rate	
Beef and wine.....	19	15	78.9	17	15	88.2	9.3
Pot roast.....	11	9	81.8	25	21	84.0	2.2
Baked chicken.....	26	23	88.5	10	7	70.0	18.5
Scallops.....	28	25	89.3	8	5	62.5	26.8
Gravy.....	19	15	78.9	17	15	88.2	9.3
Tartar sauce.....	10	9	90.0	26	21	80.8	9.2
Baked beans.....	8	8	100.0	28	22	78.6	21.4
Boiled cabbage.....	13	10	76.9	23	20	87.0	10.1
Potato salad.....	32	28	87.5	4	2	50.0	37.5
Macaroni salad.....	22	20	90.0	14	10	71.4	29.5
Kidney bean salad.....	16	15	93.8	20	15	75.0	18.8
Lettuce salad.....	25	22	88.0	11	8	72.7	15.3
Cabbage slaw.....	25	22	88.0	11	8	72.7	15.3
Cottage cheese.....	11	8	72.7	25	22	88.0	5.3
Fruit jello.....	12	10	83.3	24	20	83.3	0
Coffee.....	31	25	80.6	5	5	100.0	19.4
Tea.....	1	1	100.0	35	29	82.9	17.1
Milk.....	1	1	100.0	35	29	82.9	17.1
Vodka punch.....	32	29	90.6	4	1	25.0	65.6

laboratory found no evidence of copper, zinc, or cadmium.

No stool or vomitus samples were obtained because at the time of the investigation all vomiting and diarrhea had subsided. The laboratory staff reported that it would have been extremely difficult to isolate any toxins from the stool or vomitus. They suggested, however, that if the outbreak was caused by a chemical, the onset of illness was so violent that it was almost certain that the toxin was expelled.

These findings tentatively established massive doses of soluble tin salts as the causative agent. Although such intoxication is exceedingly rare, ingested tin has occasionally been responsible for gastrointestinal irritation causing extreme nausea, vomiting, cramping, and diarrhea (1). The concentration of tin which is toxic has not been determined. Dack (2) cites an experiment in which four subjects ate canned pumpkin containing 383-476 ppm of tin and canned asparagus containing 361 ppm of tin for 6 days with no illness. There is no hazard in the commercial packing of food in tin-lined containers under prevailing practices.

Vehicle of Transmission

The fruit punch implicated as the vehicle of transmission was purchased by the restaurant from a local dairy. Although there was no obvious fermentation, the punch, made from reconstituted pineapple-grapefruit juice, had a pH of approximately 3, indicating a relatively high acid. It was delivered to the restaurant in a retinned 5-gallon milk can at approximately 10 a.m. the day of the banquet. On delivery, the can was placed in a walk-in refrigerator and stored until almost noon. The punch was then transferred to a punchbowl and prepared to serve at approximately 12 o'clock noon.

The health department was unable to obtain information on when the punch was processed or how long or in what kind of container it was stored before delivery. If it had been permitted to stand in an open tin-lined container, oxygen would have contributed to reaction of the acid with the tin lining.

The milk can in which the punch was deliv-

ered showed obvious evidence of corrosion. A distinct line of demarcation was evident at the liquid level. Scrapings taken from the bottom and sides of the can with a sharp instrument indicated that the lining contained large amounts of tin, as determined by hydrogen sulfide precipitation and toluene dithiol confirmation.

Summary and Conclusions

On April 18, 1961, the Tri-County District Health Department, Aurora, Colo., was notified of a possible food infection or food intoxication originating at a suburban restaurant. An investigation revealed that 38 members and guests of a bowling league had attended a banquet at the restaurant and that during dinner and immediately after the meal 31 of the persons attending were stricken rather suddenly with a severe gastrointestinal irritation.

Clinical symptoms, nature of onset, attack interval, duration of illness, and attack rates all indicated that the causative agent might have been a chemical toxin or irritant rather than a bacterial infection or intoxication. Attack rates for the food items served implicated the vodka punch, and laboratory analysis verified the statistical inference. The punch was found to be contaminated with 2,000 mg. of tin per liter of punch. Details concerning handling of the punch were not available; however, it was established that it was delivered to the restaurant in a retinned milk container.

On the basis of these findings, it appeared that the illness was caused by tin poisoning, although other toxins may have been present in the lining material of the milk can. It was assumed that the contamination of the punch with tin was the result of improper handling, particularly storage and shipment in an improper container. It seems probable that the unusually high acidity of the punch (pH 3) caused reaction with the lining of the container.

REFERENCES

- (1) Taber, C. W.: Taber's cyclopedic medical dictionary. Ed. 8. F. A. Davis, Philadelphia, 1960.
- (2) Dack, G. M.: Food poisoning. University of Chicago Press, Chicago, 1955.